puting the extreme and mean monthly ranges are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: St. Luis Obispo, 52; Carson City, 50; Pierre, 49; Winnemucca and North Platte, 48; Idaho Falls, Miles City, and Huron, 47. The smallest values were: Key West, 10; Block Island and Tatoosh Island, 14; Woods Hole, 15; Nantucket, 17; Eastport and Jupiter, 19; Galveston, San Diego, and Astoria, 20.

Among the *extreme monthly ranges* the largest were: Williston, 72; Pierre, 71; Miles City, 70; Lander and Huron, 69; Havre, 68. The smallest values were: Key West, 17; Tatoosh Island, 18; Astoria, 25; Hatteras, 26; Corpus Christi, San Diego, and Fort Canby, 27.

The *accumulated monthly departures* from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
Middle Atlantic	+ 1.7	+ 0.2	New England	− 1.7	− 0.2
South Atlantic	+ 9.8	+ 1.0	Florida Peninsula	−11.6	− 1.2
East Gulf	+ 2.2	+ 0.2			
West Gulf	+11.6	+ 1.2			
Ohio Valley and Tenn.	+ 8.5	+ 0.8			
Lower Lake	+ 6.0	+ 0.6			
Upper Lake	+18.4	+ 1.8			
North Dakota	+ 3.1	+ 0.3			
Upper Mississippi	+17.0	+ 1.7			
Missouri Valley	+16.5	+ 1.6			
Northern Slope	+ 6.4	+ 0.6			
Middle Slope	+22.8	+ 2.3			
Abilene (southern Slope)	+22.8	+ 2.3			
Southern Plateau	+ 7.1	+ 0.7			
Middle Plateau	+ 3.2	+ 0.3			
Northern Plateau	+16.7	+ 1.7			
North Pacific	+ 2.2	+ 0.2			
Middle Pacific	+ 1.2	+ 0.1			
South Pacific	+ 3.8	+ 0.4			

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-point for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, is given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer; an evaporometer may be so constructed as to give the *quantity* of water evaporated from a similar surface during any interval of time. Such an evaporometer, therefore, would sum up or integrate the effects of those influences that determine the temperature as given by the wet bulb; from this quantity the *average humidity of the air* during any given interval of time may be deduced.

Measurements of evaporation within the thermometer shelters are difficult to make so as to be intercomparable at temperatures above and below freezing, and they may be replaced by computations based on the wet-bulb temperatures. The absolute amount of evaporation from natural surfaces not protected from wind, rain, sunshine, and radiation, are being made at a few experimental stations and will be discussed in special contributions.

Sensible temperatures.—The sensation of temperature experienced by the human body and ordinarily attributed to the condition of the atmosphere depends not merely on the temperature of the air, but also on its dryness, on the velocity of the wind, and on the suddenness of atmospheric changes, all combined with the physiological condition of the observer. A satisfactory expression for the relation between atmospheric conditions and nervous sensations has not vet been obtained.

PRECIPITATION.

[In inches and hundredths.]

The *distribution of precipitation* for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The total precipitation for the current month was heaviest in Nova Scotia, and also from 6 to 8 inches in small isolated regions in Louisiana and Texas and on the coast of Washington. The larger values at regular stations were: Halifax, 15.3; Charlottetown, 10.4; Port Eads, 8.8; Sydney, 7.8; Eastport, 7.1; Quebec, 7.0.

Details as to *excessive precipitation* are given in Tables XII and XIII.

The *years of greatest and least precipitation* for October are given in the REVIEW for October, 1890. The precipitation for the current month was the greatest on record at: San Antonio, 6.04; Corpus Christi, 4.12. It was the least on record only at: Rochester, 0.58.

The *diurnal variation*, as shown by tables of hourly means of the total precipitation, deduced from self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was in excess in the Canadian Maritime Provinces, the west Gulf and southern Plateau stations. It was generally deficient elsewhere. The large excesses were: Halifax, 9.6; Charlottetown, 5.9; Port Eads, 5.4; Pensacola and Sydney, 3.5; Quebec, 3.3. The large deficits were: Key West, 3.3; Jupiter, 3.2; Alpena, 3.0; Raleigh and Charleston, 2.8; Charlotte, 2.7.

The *average departure* for each district is given in Table I. By dividing each current precipitation by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: New England, 105; east Gulf, 151; west Gulf, 156; Missouri Valley, 125; middle Slope, 139; southern Slope (Abilene), 198; southern Plateau, 232; south Pacific, 267.

Below the normal: Middle Atlantic, 54; south Atlantic, 60; Florida Peninsula, 53; Ohio Valley and Tennessee, 60; lower Lake, 45; upper Lake, 73; North Dakota, 77; upper Mississippi, 89; northern Slope, 87; middle Plateau, 51; northern Plateau, 63; north Pacific, 82; middle Pacific, 81.

The *total accumulated monthly departures* from normal precipitation from January 1 to the end of the current month are given in the second column of the following table; the third column gives the ratio of the current accumulated precipitation to its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
Lower Lake	+ 1.90	106	New England	− 2.50	93
North Dakota	+ 1.20	107	Middle Atlantic	− 4.60	88
Upper Mississippi	+ 1.40	105	South Atlantic	−11.40	76
Missouri Valley	+ 0.70	102	Florida Peninsula	− 4.60	90
Northern Slope	+ 0.60	104	East Gulf	− 6.70	86
Southern Plateau	+ 1.50	121	West Gulf	− 8.10	78
Middle Plateau	+ 2.70	129	Ohio Valley and Tenn.	− 3.30	92
North Pacific	+ 1.70	104	Upper Lakes	− 2.10	93
Middle Pacific	+ 2.40	111	Middle Slope	− 1.60	92
			Abilene (southern Slope)	− 3.40	85
			Northern Plateau	− 1.00	92
			South Pacific	− 1.30	85

SNOWFALL.

The total monthly snowfall at each station is given in Table II; its geographical distribution is shown on Chart V. This chart also shows the isotherm of minimum 32° and of minimum 40° for the air within the ordinary instrument shelter. The former isotherm is an approximate limit to possible snow, while the latter is an approximate southern limit to the regions that report frost on exposed localities.

The *depth of snow on the ground* at the end of the month is given in detail in Table II, and for the winter months is also shown on Chart VI. The condition of the snow on the ground and of the ice in the rivers on Monday of each week, is also shown on the weekly charts of the Climate and Crop Service, published by the Weather Bureau during December to March, inclusive.

Snowfalls of from 12 to 20 inches were reported for October in southwestern Nebraska, Colorado, and northern New Mexico; 6 to 12 inches in North and South Dakota; 6 to 14 inches in northern Michigan, and light snows or "traces" in New England, New York, Pennsylvania, Ohio, West Virginia, Indiana, Illinois, Wisconsin, Minnesota, Iowa, and Kansas, as also in the middle and northern Rocky Mountain Plateau Region.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 1, 2, 11, 12, 27. Arkansas, 20, 22. Colorado, 7, 8, 9. Illinois, 16, 18, 19, 29. Indiana, 17, 19. Iowa, 9, 28, 29. Kansas, 28. Louisiana, 20, 21. Minnesota, 8, 16. Missouri, 28. Nevada, 27. New Hampshire, 8. New Mexico, 4, 6, 7, 9, 12, 13, 21, 28. North Dakota, 27. Oklahoma, 27. Oregon, 31. Tennessee, 12. Texas, 19, 21, 28. Utah, 27, 28. Washington, 31.

SLEET.

The following are the dates on which sleet fell in the respective States:

Colorado, 29. Illinois, 17, 19. Indiana, 18. Iowa, 17, 30. Kansas, 23. Massachusetts, 17. Michigan, 6 to 9, 17, 18, 19, 23, 24. Minnesota, 30, 31. Montana, 9, 27. Nebraska, 5, 28, 29, 30. New Mexico, 27. New York, 7, 18, 19, 21, 22. North Dakota, 17, 26, 27. Pennsylvania, 18. South Dakota, 17, 28 to 31. Utah, 27, 28. Washington, 31. West Virginia, 17. Wisconsin, 16, 18, 19, 31.

WIND.

The *prevailing winds* for October, 1896, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

HIGH WINDS.

Maximum wind velocities of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Block Island, R. I	11	72	ne.	Fort Canby, Wash	29	60	s.
Do	12	78	ne.	Do	30	66	s.
Do	13	68	ne.	Hatteras, N. C	11	67	n.
Do	15	51	ne.	Kittyhawk, N. C	10	60	ne.
Boston, Mass	12	50	ne.	Do	11	72	ne.
Chicago, Ill	29	62	s.	Do	12	56	nw.
Do	30	51	sw.	Nantucket, Mass	11	50	ne.
Duluth, Minn	30	55	ne.	Do	12	60	ne.
Eastport, Me	24	58	s.	Tatoosh Island, Wash.	30	52	s.
El Paso, Tex	13	50	nw.	Winnemucca, Nev	31	50	sw.
Fort Canby, Wash	28	60	s.				

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 20 regular stations of the Weather Bureau by its photographic, and at 25 by its thermal effects. At one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table XI for each hour of local mean time.

Photographic and thermometric registers give the duration of that intensity of sunshine which suffices to make a record, and, therefore, they generally fail to record for a short time after sunrise and before sunset, because, even in a cloudless sky, the solar rays are then too feeble to affect the self-registers. If, therefore, such records are to be used for determining the amount of cloudiness, they must be supplemented by special observations of the sky near the sun at these times. The duration of clear sky thus specially determined constitutes the so-called twilight correction (more properly a low-sun correction), and when this has been applied, as has been done in preparing Table XI, there results a complete record of the clearness of the sky from sunrise to sunset in the neighborhood of the sun. The twilight correction is not needed when the self-registers are used for ascertaining the duration of a special intensity of sunshine, but is necessary when the duration of cloudiness is alone desired, as is usually the case.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table XI.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the duration relative to possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for October, 1896, is 7 per cent for photographic and 5 per cent for thermometric records.

The details are shown in the following table, in which the stations are arranged according to the greatest possible duration of sunshine, and not according to the *observed* duration as heretofore.